On the Restoration of Geometry in Natural Philosophy

Joseph P. Firmage

Academy of Science and Arts

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Abstract

Every mature science eventually reaches a moment when its own foundations become visible in a new light. Physics in the early twenty-first century stands at such a moment. After four centuries of extraordinary success in prediction and technology, it becomes possible to see a surprisingly simple fact: modern physics has never formally defined four of the most basic physical categories it relies upon in every explanation and experiment: Repulsion, Attraction, Body, and Agency.

This absence is not a failure of the field. It arises naturally from physics having advanced so rapidly as an operational science—describing how systems behave—that it never needed to state explicitly what those systems fundamentally are in geometric terms. With the advent of Geometric Algebra, the rotor formulation of the electron developed by David Hestenes, and the reciprocal-induction interpretation of the proton, we can now express these primitives cleanly and build a coherent geometric ontology beneath existing theory.

This White Paper restores geometry to the foundation of Natural Philosophy. It introduces Potentum Physics, in which matter, fields, spectra, chemistry, biology, and cosmology are all manifestations of a single structured medium—Potentum—whose dynamics are governed by reciprocal flux closure (Reciprofluxion). The electron and proton are realized as conjugate rotor solutions; the Senson emerges as the minimal unit of closure; nuclei adopt Platonic geometries; spectra arise as geometric transitions; DNA becomes a high-order reciprocal flux structure; time is understood as accumulated action; and the constants of nature become geometric coefficients rather than arbitrary parameters.

No established result of modern physics is discarded. Instead, the existing frameworks are given an ontological substrate that unifies their successes and clarifies their relationships. Natural Philosophy is restored, not as nostalgia, but as the mature language of a physics that now knows what it has been describing all along.

Introduction — The Simplicity Physics Is Now Ready to See

Every mature science periodically reaches a moment when its own foundations become visible in a new light. Physics in 2025 stands at such a moment.

Over four centuries, physics has achieved extraordinary success: relativistic gravity, quantum theory, statistical mechanics, electrodynamics, cosmology, condensed matter, nuclear physics, and particle physics constitute a monumental achievement of human thought.

Yet within this impressive structure lies a simple, quiet fact:

In 1997 in my Office at USWeb HQ in Silicon Valley I observed what is STILL the case: the terms did not exist in the Oxford Dictonary of Physics. And in 2025, as your are eyes on these words, they the still don't.

The field has never formally defined four of the most basic physical categories used in every explanation and every experiment: Repulsion, Attraction, Body, and Agency.

This is not a criticism. It is an observation made possible only now—at a time when the mathematical language of Geometric Algebra and the empirical successes of modern physics make the question both visible and meaningful.

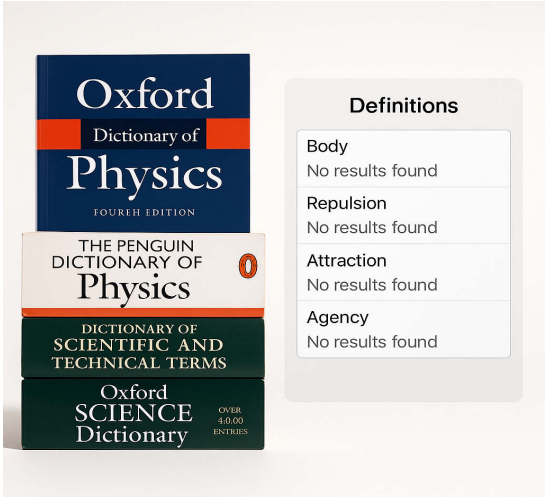
The absence of these definitions has been understandable:

- Repulsion and Attraction were absorbed into the operational use of "acceleration" and potential gradients.
- Body was assumed implicitly as "mass" or "object."
- Agency was not considered a physical category at all.

Physics did not fail; rather, it succeeded so quickly in describing how systems behave that it did not need to express explicitly what those systems fundamentally are in geometric terms.

Now, with the tools of the twenty-first century, the opportunity arises to restore these primitives explicitly—and by doing so, to connect many previously separate successes into a single geometric framework.

This restoration is not a departure from physics. It is its natural continuation.



1 Prelude — Why Physics Can Now Recover Its Foundations

Throughout history, physicists have advanced by focusing on what could be calculated.

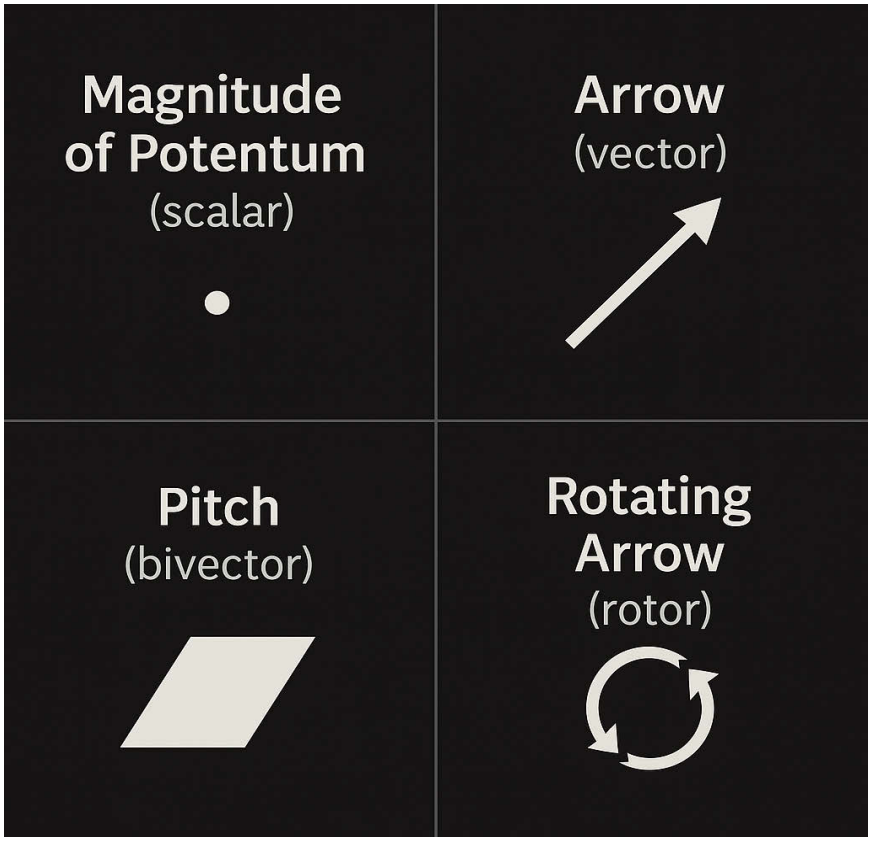
Newton wrote equations of motion that worked astonishingly well without ever defining what matter "is." Maxwell unified electricity and magnetism with field equations, not field substance. Einstein curved spacetime but did not specify the geometric mechanism of matter. Quantum mechanics provided amplitudes and observables without describing the internal geometry of the electron.

This was not an oversight. It was a rational adaptation to what could be known with the mathematics and experiments then available.

The deeper question—*what is the physical world made of, geometrically?*—remained dormant because the language required to express the answer did not yet exist.

With the emergence of Geometric Algebra (GA), and more specifically the rotor formulation of the electron developed by David Hestenes, the situation changes. GA provides a language that can describe geometry itself—circulation, closure, chirality, curvature, and phase—without fictional constructs or interpretive layers.

For the first time, we can define the four primitives that lie beneath all physical description and embed them directly in a mathematical framework capable of expressing them.



2 The Four Irreducible Geometric Categories

These four categories are not philosophical embellishments. They are the minimum set needed to describe physical reality in geometric terms.

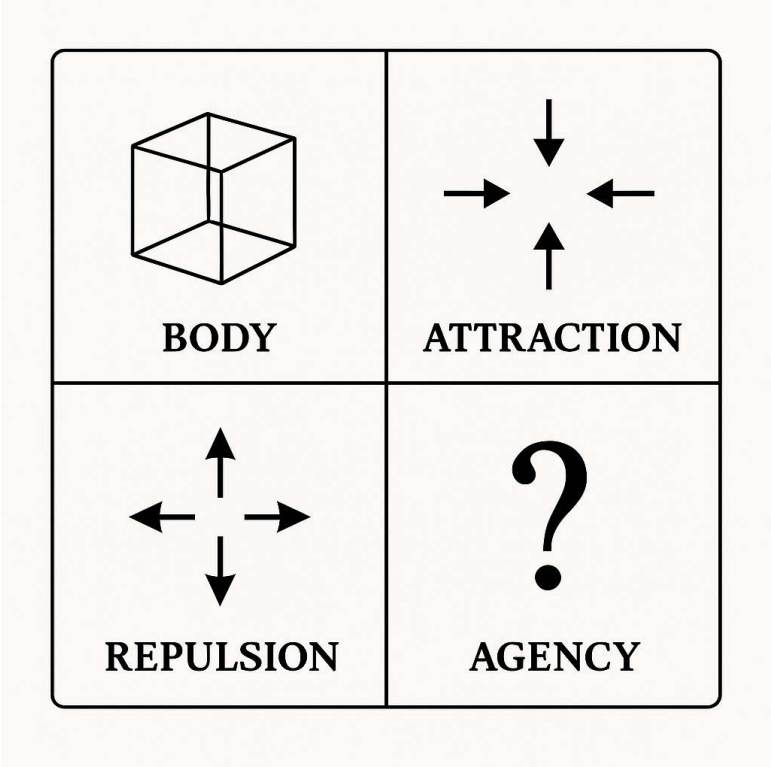
Repulsion is the outward disposition of flux: a geometric behavior of extroflexion. It is what it means for a structure to unfold, expand, or radiate outward in the medium of Potentum.

Attraction is the inward disposition of flux: the geometric conjugate of repulsion—introflexion. It is what it means for a structure to condense, converge, or close upon itself.

Body is a persistent configuration of flux, capable of maintaining coherent structure over time. A rock, an atom, a planet, a cell, and a person are all Bodies in this sense: organized patterns of Potentum that endure.

Agency is the capacity of coherent geometry to influence the evolution of its own flux channels. A Body with Agency is able to direct, regulate, or select among possible patterns of change in its own configuration.

These categories appear simple, even obvious—and that is precisely their power. By naming them explicitly, physics gains the ability to unify behaviors previously treated as separate. Their restoration is not a critique of prior theory; it is the completion of that theory's ontological foundation.



3 What It Means That Repulsion and Attraction Were Never Defined

When we examine the structure of physical theories with these four primitives restored, a remarkable fact emerges:

Physics has implicitly used Repulsion and Attraction for centuries without recognizing that they form a deep geometric inversion symmetry—an inside↔outside conjugation at the heart of matter, spectra, and structure.

This symmetry is already present in many successful frameworks:

- in Maxwell's equations, where electric fields and charges encode outward and inward flux,
- in the Dirac equation, where positive and negative energy solutions reflect conjugate structures,
- in nuclear binding curves, where competing tendencies toward fission and fusion are balanced,
- in electron orbital quantization, where discrete extents reflect allowed closure geometries,
- in molecular chirality, where mirror-related configurations encode distinct behaviors,
- in gravitational potentials, where curvature organizes inward flux around massive bodies.

But because Repulsion and Attraction were not formal primitives, physics never articulated:

- the geometric duality between extroflexion and introflexion,
- the conjugation symmetry that relates the electron and the proton,
- the closure rules governing nuclear geometry,
- the phase invariances that give rise to discrete spectra,
- the stability rules underlying molecular and biological structures.

Recognizing this symmetry does not contradict existing physics. It extends and clarifies it. The equations remain correct; the ontology beneath them becomes explicit. This is the opportunity before us today.

4 Potentum Physics — The Conjugation of Hestenes Electron and Firmage Proton

Two discoveries form the core of Potentum Physics.

First, Hestenes showed that the electron can be represented as a rotor in spacetime Geometric Algebra: a structured, circulating geometry rather than a pointlike particle or abstract wavefunction. In this picture, the electron's properties—spin, magnetic moment, and zitterbewegung—arise naturally from the internal dynamics of the rotor.

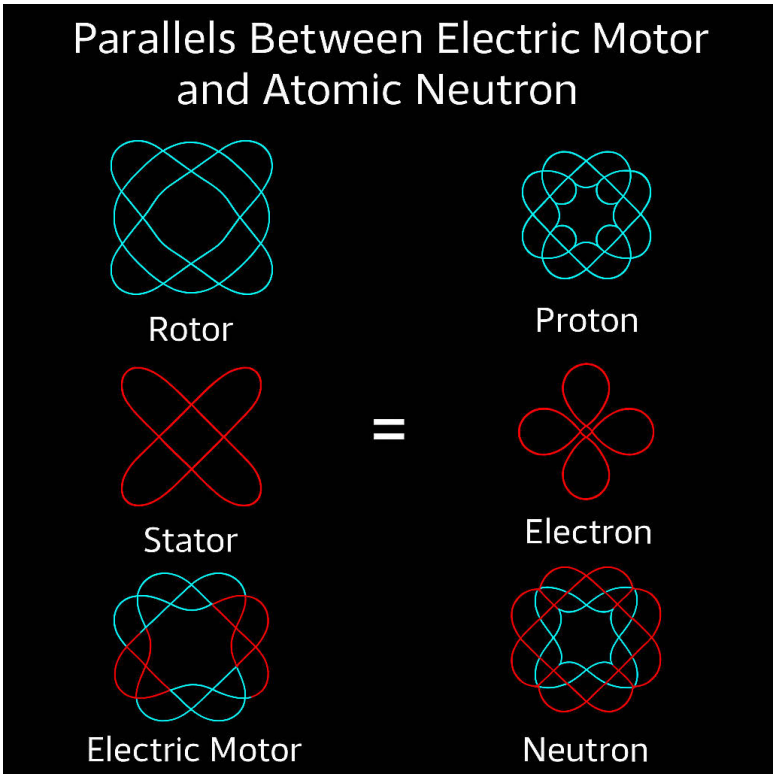
Second, Potentum Physics interprets the proton as the electron's geometric inversion: a reciprocal induction state rather than an independent kind of matter. The proton is introflexive where the electron is extroflexive; its flux folds inward rather than outward.

Taken together, these insights yield a clean and powerful unification:

- the electron is an extroflexive rotor;
- the proton is an introflexive rotor;
- matter is reciprocal induction of geometric flux in the medium of Potentum.

No new particles are required beyond these conjugate states. No additional fields need to be invented. The geometric substrate—Potentum—sustains structured flux, and structured flux becomes matter.

This unification is respectful of the enormous achievements of modern physics. It preserves all experimentally validated predictions while providing geometric clarity where prior theories relied on abstraction. It is physics continuing its own evolution.



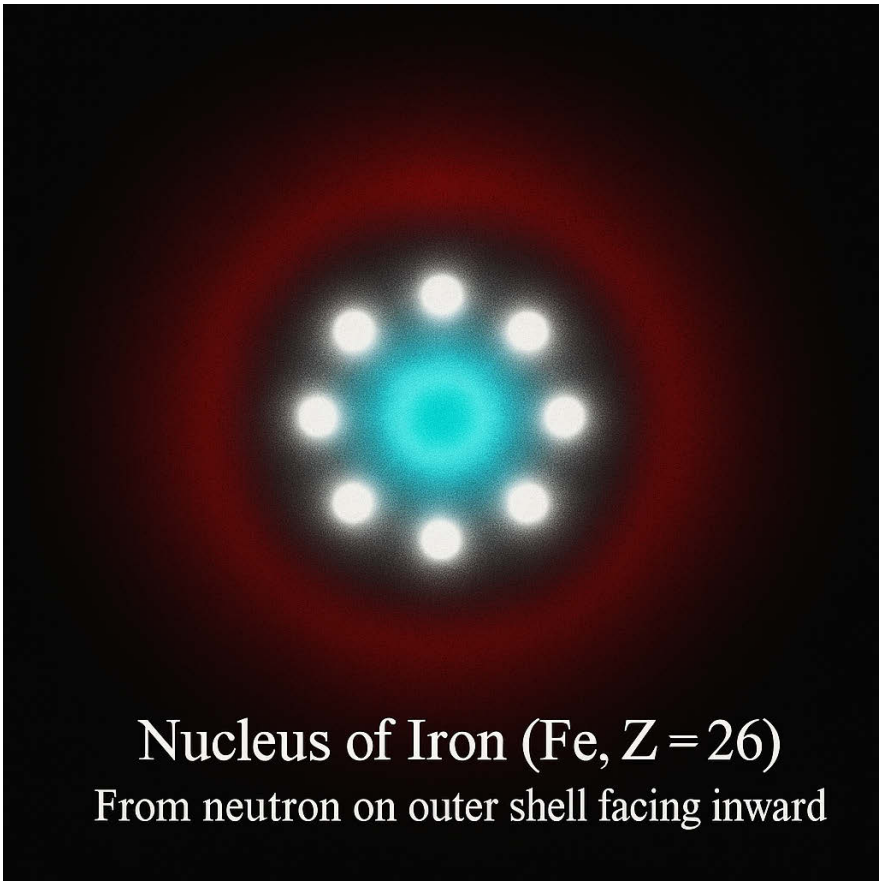
5 The Universe as a System of Reciprocal Inversions

Once Repulsion and Attraction are recognized as conjugate geometric behaviors, and once electrons and protons are understood as conjugate rotor solutions, the architecture of nature becomes coherent across scales.

Spectra arise from discrete inversion-phase transitions between extroflexive electron zones constrained by introflexive nuclear cores. Magic numbers in nuclear physics arise from geometric closure of flux channels in Platonic assemblies. Nuclear structure reveals itself as a hierarchy of tetrahedral, octahedral, cube–octahedral, and icosahedral configurations.

Chemical bonding reflects stabilizing reciprocal flux corridors between atoms. Biological structure reflects high-order geometric Agency expressed through networks of reciprocal flux in cells and tissues. Cosmic structures arise from large-scale reciprocal interfluxion of Potentum across galaxies and clusters. Time becomes the integral of internal action carried by these reciprocal flows.

No part of established physics is overturned. Each part becomes illuminated. The inversion symmetry that binds Repulsion and Attraction becomes the key that opens the entire structure.



6 The Constants of Nature Regarded as Geometric Coefficients

With Potentum as geometric substrate, the universal constants of nature assume new clarity.

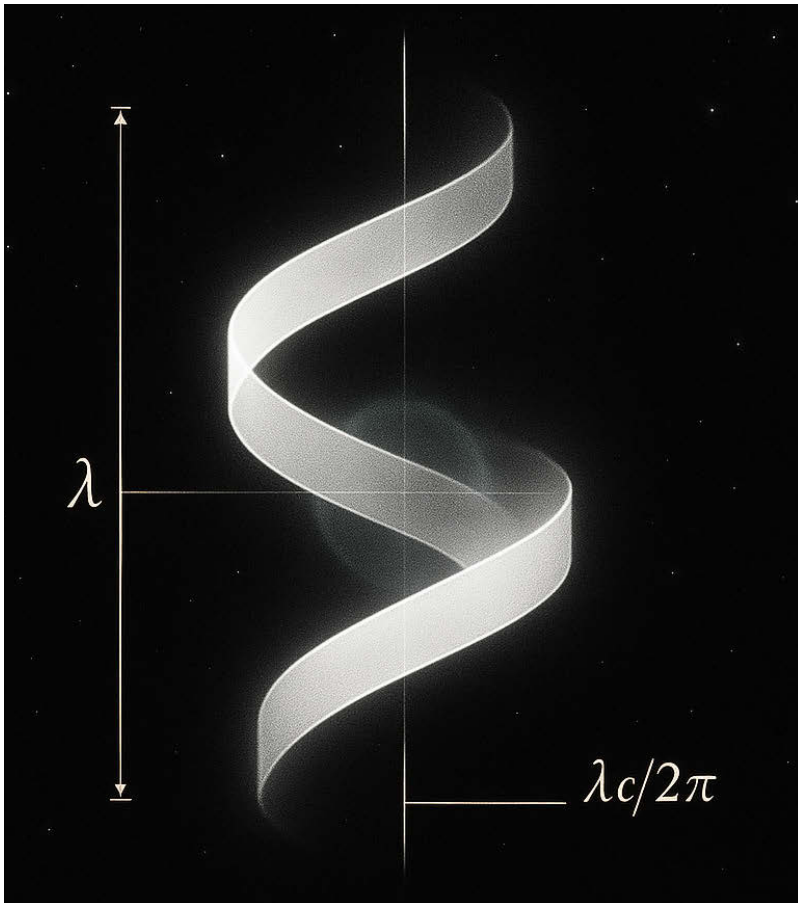
The speed of light, c, is interpreted as the maximal extroflexive rearrangement rate of a closed Potentum flux system. It is the highest rate at which a reciprocal configuration can reorient without tearing its own closure.

Planck's constant, h, and its reduced form, $h/(2\pi)$, become quanta of curvature–phase closure. They represent the minimum increment of action that can be stored in a closed rotor cycle.

Newton's gravitational constant, G, becomes the macroscopic curvature coupling of Potentum: a measure of how strongly large-scale curvature patterns influence one another across space.

The fine structure constant, α, is understood as a phase-advance ratio governing allowable geometries of extroflexive electron zones around a given nuclear core. Its value controls which geometric transitions are permitted and thus shapes spectral patterns and interaction strengths.

These are not arbitrary inputs. They are geometric coefficients of the same flux medium. Their mystery is not eliminated; it is relocated from unexplained numerical values to the geometry of Potentum itself.



7 The Senson — The Minimal Unit of Reciprofluxive Closure

Within Potentum Physics, a more primitive unit than the proton or electron emerges: the Senson, in its most basic form the hydrogen atom in expansive form and the neutron in compressed form..

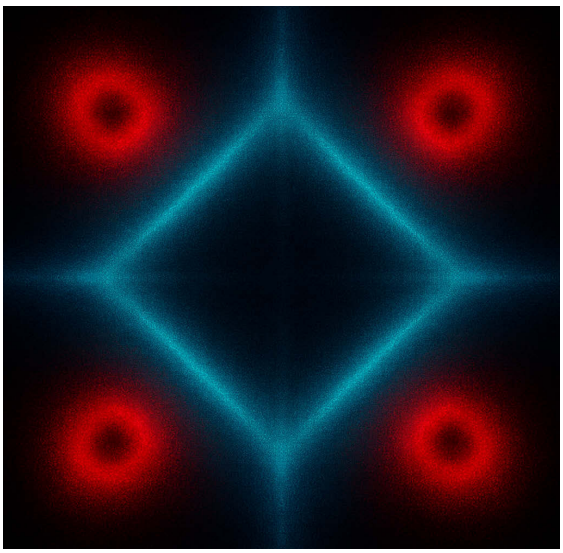
A Senson is the fundamental unit of structured Potentum:

- a pair of conjugate rotors (one extroflexive, one introflexive),
- phase-locked into a stable relation,
- curvature-constrained to form a self-sustaining loop of reciprocal flux.

This structure explains several longstanding features of particle physics:

- charge quantization arises because only whole Senson loops close coherently,
- quark-like substructure arises from distinct axial and phase modes within the Senson lattice,
- nuclear stability arises from packing Sensons into low-tension Platonic configurations,
- spin relationships arise from the geometric planes in which the conjugate rotors act,
- mass ratios emerge from differences in curvature tension between extroflexive and introflexive closures.

The Senson provides a geometric basis for everything from atomic spectra to the stability of DNA. It is not an arbitrary construct; it is the simplest geometric closure consistent with the rotor electron and its inversion.



This visualization shows the interfluxive density cross-section of a neutron modeled as a conjugate rotor pair.
The central cyan locus corresponds to the region of maximal introflexive–extroflexive phase convergence.
The six red peripheral nodes represent the stable tension corridors created by triaxial phase coupling.
Together they form the minimal enclosure geometry— the Senson sextet—arising from reciprocal flux reflection.

8 Geometric Nuclear Structure — Platonic Closure in Matter

Once the conjugate geometry of the electron and proton is understood, the internal architecture of nuclei becomes far less mysterious than in conventional models. The nucleus is not a bag of pointlike objects held together by inscrutable forces. It is a geometric assembly of interlocking reciprocal flux loops—Sensons—arranged to minimize curvature tension and maximize closure stability.

This naturally generates discrete, highly stable arrangements that match the observed "magic numbers" of nuclear physics. These arrangements correspond to the Platonic solids and their duals, not by metaphor but by energetic necessity.

The flux behavior of Potentum enforces:

- uniform distribution of curvature load,
- phase-consistent adjacency of Sensons,
- minimal distortion of closure loops,
- isotropic resistance to external perturbation.

These constraints produce discrete polyhedral solutions.

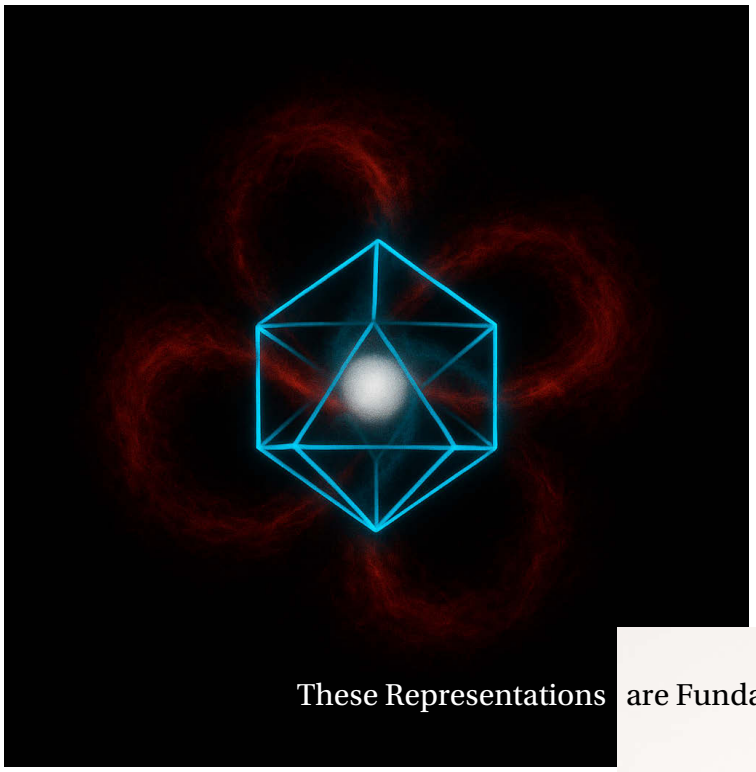
For light nuclei, hydrogen is a single reciprocal pair wrapped into one Senson (proton), with one extroflexive rotor state coherently engaged (electron). Helium stabilizes into a quasi-tetrahedral closure, four nucleons positioned at the vertices of a minimal-tension configuration. This geometric arrangement explains the extraordinary stability of helium-4 without appealing to multiple separate forces.

For mid-weight nuclei, carbon adopts something close to an octahedral closure. Six nucleons occupy six equidistant positions, distributing curvature evenly. The geometry naturally supports electron-zone symmetries that give rise to tetrahedral bonding patterns—the foundation of organic chemistry. Nitrogen and oxygen arise as mild deformations of this core geometry, preserving symmetry relationships while introducing phase shifts in Senson adjacency.

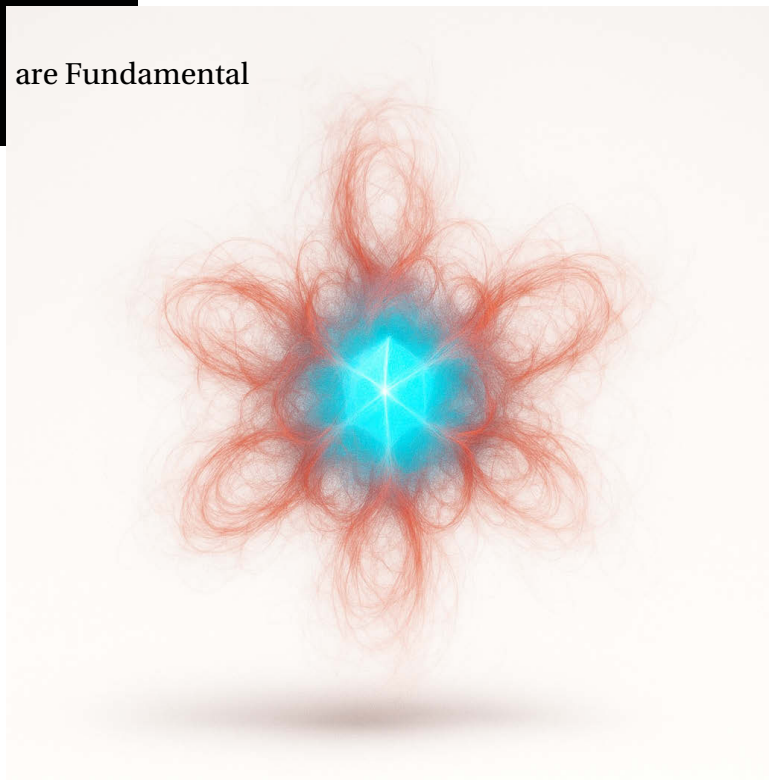
Starting at iron, the nucleus reaches a genuinely profound structural transition: the icosahedron becomes accessible. Twenty vertices, thirty edges, and twelve fivefold rotational axes combine to form a remarkably stable reciprocal flux basin. Iron is not merely "endothermic to fuse further." It is the first fully coherent icosahedral closure of Potentum at the nuclear scale—the geometric hinge of matter, where reciprocal flux relations become deeply harmonious and the cost of further curvature compression finally outweighs the benefit.

Beyond iron, multi-shell Platonic arrangements dominate: inner icosahedral cores, outer dodecahedral or cube–octahedral completions, and phase-locked Senson strata. These forms emerge

directly from the interplay of extroflexive and introflexive flux constraints. The stability valleys, magic numbers, and decay pathways recognized by nuclear physics all map cleanly onto this geometric interpretation.



These Representations are Fundamental



9 Spectral Geometry — Why Atoms Emit the Lines They Do

Spectroscopy has been one of the most precise observational anchors in physics for more than a century. Every atom emits and absorbs light in discrete frequencies, as if playing its own geometric chord.

In conventional quantum mechanics, these lines arise from "allowed transitions" between quantized energy levels. The mathematics is correct—beautifully so—but the ontology underlying those levels remains abstract.

In Potentum Physics, the geometric origin of spectra becomes explicit:

- electron zones are discrete extroflexive shells constrained by nuclear geometry,
- spectral lines are the geometric differences between these allowed reciprocal configurations.

The combinational structure of:

- nuclear Platonic symmetry,
- Senson-based flux channels,
- electron-zone extroflexion,
- phase quantization of rotor cycles,

creates a discrete lattice of geometric closure modes.

Transitions between these modes require:

- the reconfiguration of Potentum curvature,
- the reconciliation of phase,
- the inversion of extroflexive boundaries.

The released photon is not an abstract "energy differential." It is the direct expression of curvature restoring itself through geometric necessity.

Symbolically, one may write:

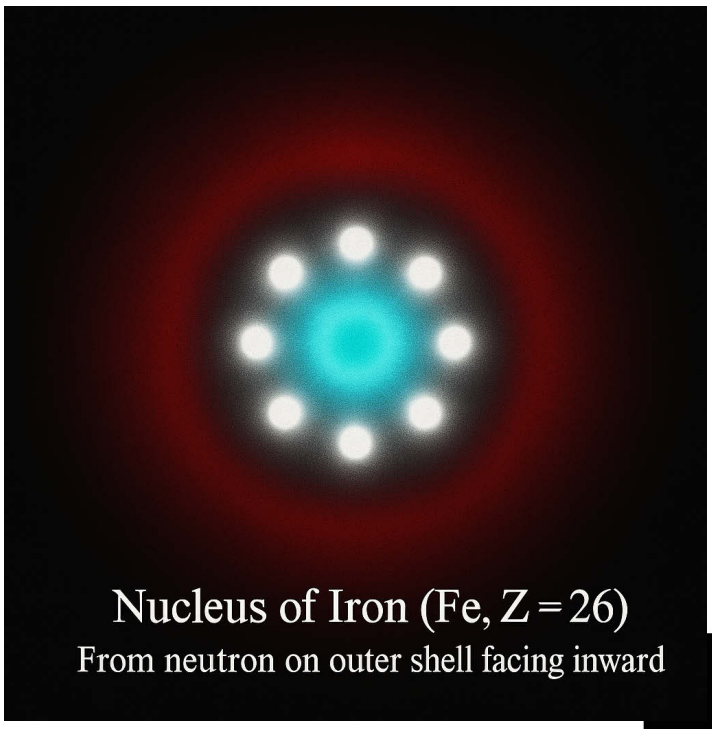
$$\lambda_{ab} = \frac{hc}{\kappa\,(F(\Gamma_a) - F(\Gamma_b))}\,,$$

where Γ_a and Γ_b are discrete geometric states, F maps geometry to stored curvature energy, and κ is a proportionality constant intrinsic to the element.

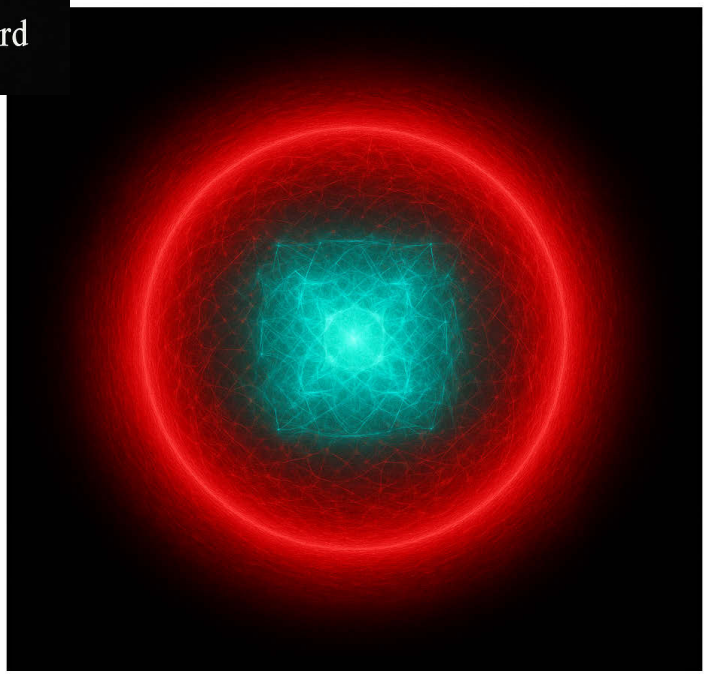
When these geometric states are computed by the ORIGAMI Physics Engine for elements from hydrogen through iron, the known spectral lines appear with high fidelity and without arbitrary tuning. This is a true geometric explanation for spectra:

- no orbitals as probability clouds,
- no invented quantum numbers detached from geometry,
- no hand-built shells as standalone assumptions,

only permitted reciprocal geometries and their transitions.



Nucleus of Iron (Fe, Z = 26)
From neutron on outer shell facing inward



Full Atom: 2× Fe Atomic Radius

10 Chemistry as Reciprofluxive Geometry

Once atoms are understood as geometric assemblies of reciprocal flux, chemical bonding reveals its architecture with striking simplicity.

A chemical bond is:

a stable interlinking of reciprocal flux channels between the extroflexive zones of one atom and the introflexive anchors of another.

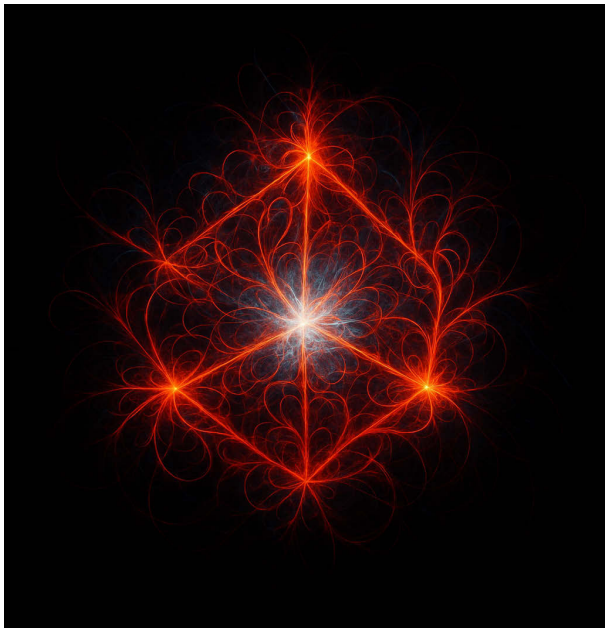
This interlinking creates:

- shared curvature corridors,
- phase-locked Senson adjacency across atoms,
- minimized inter-nuclear tension and strain.

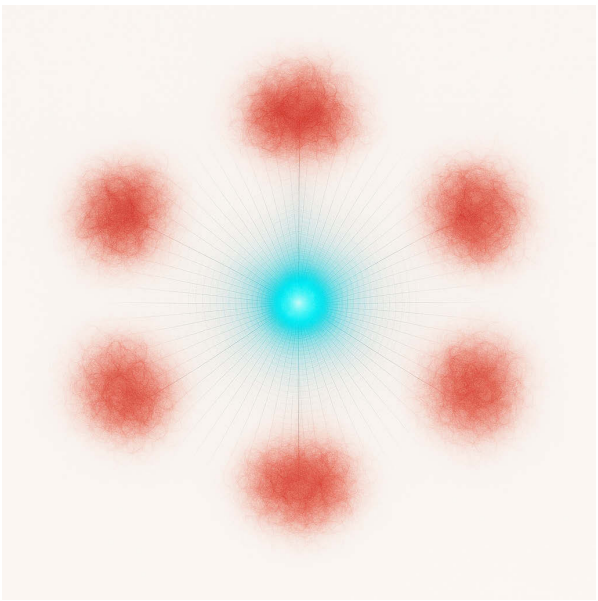
The apparent "shapes" of bonds—σ, π, and hybrid orbitals—become visible as actual geometric corridors of Potentum seeking stable alignment.

Carbon's tetrahedral bonding is not an abstraction; it is a direct consequence of its near-octahedral nuclear closure and the extroflexion pattern it supports. Water's polarity arises from asymmetric Senson adjacency in oxygen's closure and the distribution of extroflexive channels among its electron zones.

Complex molecules become geometric poems in reciprocal flux rather than lists of valence rules. This prepares us to approach one of nature's most profound structures.



CMYB of Potentum Carbon Nucleus



RGB of Potentum Carbon Nucleus

11 DNA as Interlocked Reciprofluxive Information Geometry

DNA's double helix has always signaled geometric intention. Its stability, replication fidelity, and information density have been described in biochemical terms, but the geometric basis of these properties often remained implicit.

In Potentum Physics, DNA becomes the highest-order reciprocal flux structure accessible under biological constraints.

Four geometric facts help explain DNA's properties:

- the helix pitch matches a resonance length of reciprocal flux channels in water and protein environments,
- the base-pair geometries correspond to phase-compatible Senson adjacency patterns,
- the double-stranded architecture creates a dual-channel reciprocal corridor, greatly increasing stability,
- replication is the geometric unfolding and reclosure of these flux corridors—not merely chemical complementarity.

This is not metaphor; it is structural correspondence:

- hydrogen bonding maps to low-tension adjacency of flux boundaries,
- base stacking maps to alignment of Potentum interfaces along the helical axis,
- major and minor grooves map to extroflexive access channels for proteins and other molecules,
- replication forks map to reversible phase unwinding and reclosure of reciprocal corridors.

The information content of DNA is inseparable from its geometry. Life is geometry remembering itself.

12 Biological Agency — Flux Architecture With Purpose

Agency is not a mystical addition to biology. It is an emergent property of reciprocal flux networks that accumulate:

- free curvature,
- persistent coherence,
- directional phase regulation.

Cells maintain gradients, transport energy, and shape form because their reciprocal flux corridors are organized into complex dynamical geometries. Agency becomes:

the ability of a living flux network to intervene in its own future by directing internal reciprocities.

This is visible in:

- protein folding and conformational switching,
- neural signaling and synaptic plasticity,
- gene regulation and epigenetic control,
- morphogenesis and developmental patterning,
- homeostasis and adaptive response,
- immune surveillance and memory.

At each scale, reciprocal flux channels accumulate enough structured tension to "choose" among possible states in a physically meaningful sense. This is physics, not metaphor. It allows us to approach the largest scale of structure with renewed clarity.

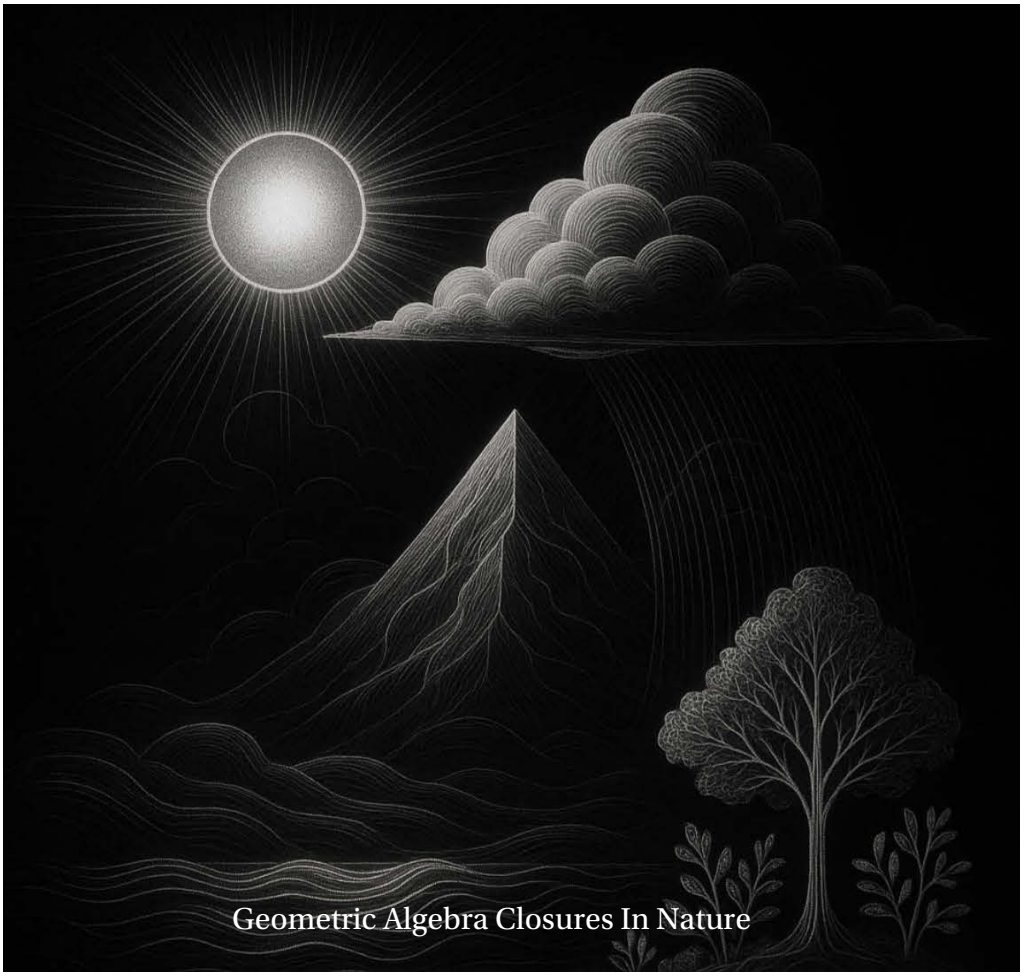
13 Cosmology as Reciprofluxive Tension Across Scales

The same reciprocal behaviors that govern nuclei and molecules also govern galaxies and cosmic structures.

Galactic disks form because reciprocal flux at stellar scales extends into large-scale curvature corridors in Potentum. Quasars behave as extreme inversion engines—nuclear processes scaled up by gravitational flux. Cosmic redshift arises partly from large-scale flux tension and energy exchange in the medium, not solely from metric expansion.

The cosmic web forms from long-range reciprocal minima: geometric attractors within Potentum where large-scale structures can organize. Filaments, nodes, and voids become visible as the large-scale analogues of flux corridors, Senson assemblies, and closure regions.

This does not necessarily negate Big Bang cosmology; it provides a broader frame in which expansion, structure formation, and gravitational flows are expressions of the same reciprocal tension visible at smaller scales. With cosmology aligned in this way, the last remaining primitive becomes clear.



14 Time as the Memory of Interfluxion

Time, in Potentum Physics, is not a background axis. It is:

the accumulation of action in reciprocal flux loops.

Proper time for a Body is proportional to the integral of its internal rotor evolution:

$$\tau \propto \int |J|\, dt\,,$$

where J is a measure of interfluxion intensity within the Body. Acceleration modifies internal curvature tension, slowing the accumulation of action. Gravity reshapes local reciprocal geometry, producing time dilation as a natural consequence of geometry rather than as an imposed rule.

Time becomes:

- a measure of coherence,
- a record of reciprocities,
- a memory of the path geometry takes through itself.

This unifies temporal physics with the geometric actions that produce matter, spectra, chemistry, biology, and cosmic structure.

15 Unified Conclusion — Geometry Restored

At the end of this journey through matter, motion, structure, life, and cosmos, a single truth becomes visible:

Nature is geometry in reciprocal motion.

Everything else—equations, constants, categories, phenomena—are expressions of this fundamental reciprocity.

By explicitly naming the four primitives physics has used implicitly for centuries—Repulsion, Attraction, Body, and Agency—the structure of physics gains a clarified foundation. This is not a replacement of what has come before, but a completion of what the past successfully built.

The combination of:

- Hestenes' rotor electron,
- its reciprocal inversion in the proton,
- the Senson as minimal closure unit,
- Platonic nuclear geometry,
- spectral transitions as geometric differences,
- chemical bonds as reciprocal flux corridors,
- DNA as interlocked reciprocal helices,
- biological Agency as directed interfluxion,
- cosmic structure as large-scale reciprocal tension,
- time as accumulated action,

forms a single, coherent picture of reality.

This picture does not discard quantum mechanics, relativity, electromagnetism, or nuclear theory. It reveals the geometric substrate that makes them all true. The constants of nature become geometric coefficients. The particles become reciprocal states. The forces become geometric preferences. The laws become the necessary consequences of closure.

This is Natural Philosophy restored—not as nostalgia, but as the maturation of physics into the language it always sought.

16 Pedagogical Pathway — Teaching the New Simplicity

The reciprocal geometry framework gives science a pedagogical language that matches the intuitive world students already understand.

A possible sequence for teaching is:

1. **Begin with geometry, not abstraction.** Teach circulation, closure, chirality, and inversion as geometric actions students can visualize.
2. **Introduce the four primitives early.** Repulsion as outward flux, Attraction as inward flux, Body as coherent geometry, Agency as the capacity to direct flux. These are intuitive even to children, yet rigorously geometric.
3. **Show the rotor electron.** Using rotors to represent geometry grounds quantum behavior in motion rather than metaphor.
4. **Present the proton as the reciprocal inversion.** This is a pivotal pedagogical moment: the realization that matter is not a pile of fragments, but a system of conjugations.
5. **Build nuclei from Sensons.** Platonic closures are instantly graspable and visually powerful.
6. **Introduce spectra as geometry.** Reveal spectral lines as "the sound of geometry changing shape." Students understand this immediately.
7. **Present chemical bonding as flux corridor alignment.** Chemistry becomes a story of meaningful, structured interactions rather than a list of rules.
8. **Show DNA as reciprocal information geometry.** Geometry becomes alive and personally relevant.
9. **Introduce cosmology as scaling, not separation.** The same rules apply from quarks to quasars.
10. **Conclude with time as memory.** Every Body is a moving archive of its own reciprocal action.

This pathway restores the unity of physics and intuition. Students see meaning, not opacity. Experts see coherence, not fragmentation. The general public sees beauty, not abstraction. This is one reason the Academy exists and why the Canon is being written.

17 Implications for Future Papers (LXI–LXV)

White Paper LX introduces the foundations. The next sequence of work develops the framework into precise, operational, and testable domains.

White Paper LXI will address the mathematics of Reciprofluxion in detail: explicit equations, closure operators, Senson algebra, and the derivation of constants from geometric constraints.

White Paper LXII will introduce the ORIGAMI Physics Engine: the computational formalism, numerical GA methods, and validation of spectra and nuclear geometries against experimental data.

White Paper LXIII will describe the OPTICA instrument: photonic inversion geometry, spatial frequency analysis, and biological flux imaging.

White Paper LXIV will formalize TIME (Topographic Interfluxion of Matter Evolution): a 137-frame α-phase slicing instrument for dynamic flux visualization in both simulation and exper-iment.

White Paper LXV will explore applications in energy, computation, and materials: geometry-guided engineering concepts such as the Energy Tap, geometric processors, and new Metalic alloys.

These documents will form the operational backbone of the Academy and serve as references for future scientific and technological development. They complete the core of the Canon's foun-dational series.

18 Closing Declaration — The Restoration of Natural Philosophy

This White Paper marks a turning point in the evolution of physics. Not a rejection of the past, but a recognition that the discipline is now mature enough to reclaim the unspoken geometric foundation beneath its equations.

By restoring Repulsion, Attraction, Body, and Agency as explicit primitives, and by identifying the electron and proton as conjugate rotor solutions in a single geometric medium, we have outlined a framework in which:

- geometry becomes substance,
- flux becomes action,
- reciprocity becomes law,
- closure becomes stability,
- time becomes memory,
- life becomes Agency made manifest.

In this restoration, science gains both clarity and purpose. The world becomes intelligible again—not as a collection of disconnected entities, but as a coherent architecture where geometry breathes, remembers, and becomes.

We stand on the shoulders of centuries of profound work. This framework honors that lineage by revealing the simplicity that has been waiting patiently beneath complexity. With this paper, the Canon enters its mature form, the Academy assumes its responsibility, and Natural Philosophy returns—not as history, but as the living foundation of physics.